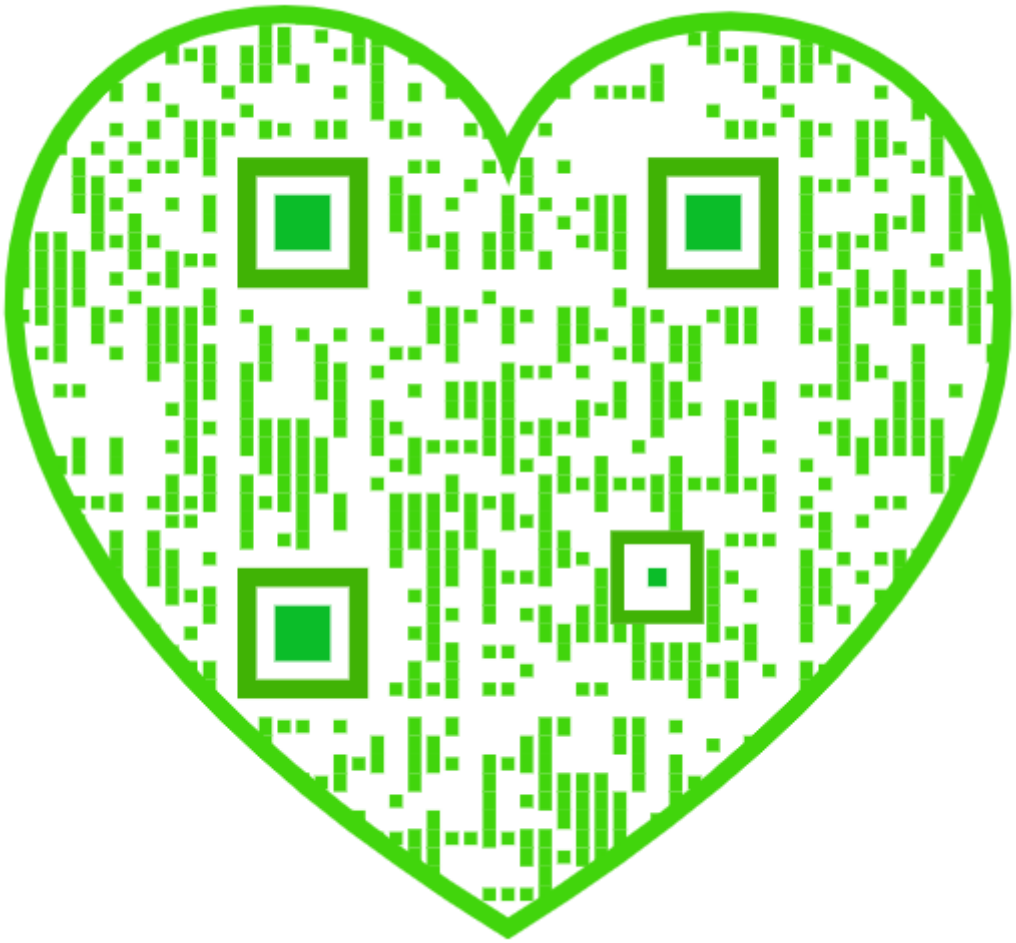
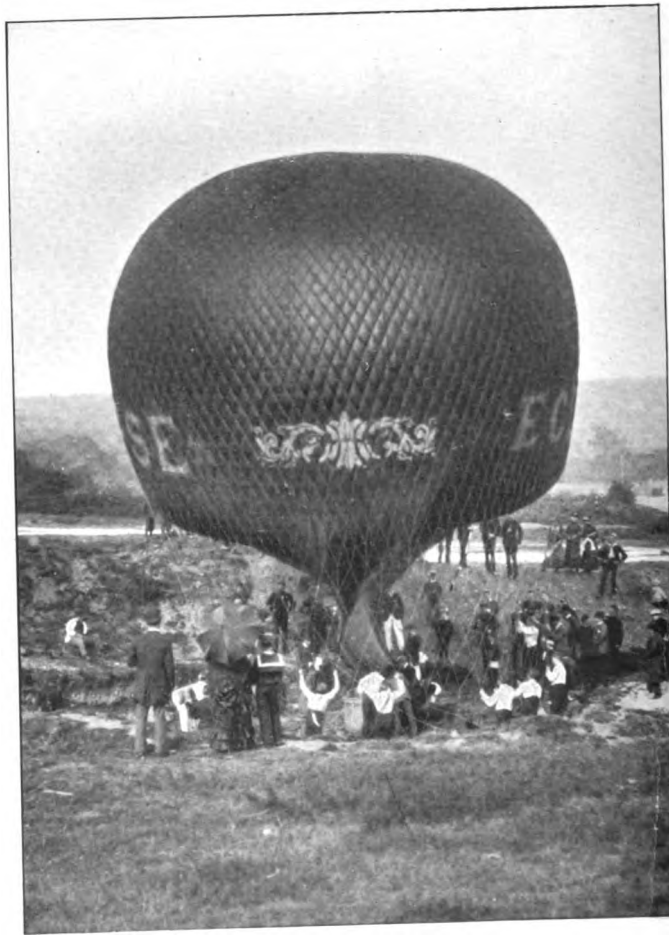


Ballooning as a Sport



"THE ECLIPSE"

INFLATING AT ALDERSHOT.

Ballooning As a Sport

BY

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(LATE SCOTS GUARDS)

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INTRODUCTION.

I FEAR that the matter contained in these pages may appear somewhat egotistical, but I must explain the situation. This matter is but a *réchauffé* of a few articles, mostly written some years ago. At that time there were not many other amateur aeronauts —now they exist by the dozen. During the last year or two ballooning has become very popular: several keen and energetic advocates have taken up the subject (always one which appeals to the public); the Aero Club has been founded, and the sport now

has a recognised footing. Why all this should so suddenly come about I cannot say, for there has been no special improvement in the machine itself, nor has any new use for it been found. The only wonder is, that it was not more keenly taken up before.

But already the past history of the sport, such as it is, seems to be forgotten. A new school has arisen which knows not its Joseph. It may not be out of place, therefore, to relate shortly some of the events of what we may call the middle ages of ballooning, especially as regards the various clubs and institutions which have flourished and dwindled and are now forgotten.

It is not worth while giving any account of the early dawn of ballooning in England: of Lunardi, who

made the first ascent; of Blanchard, the first professional; of Green, who popularised the sport so much in the 'thirties; or even of Coxwell, who made such memorable ascents with Glaisher (although I had a chance of an ascent with him). I shall speak, therefore, only of the period during which I became smitten with this fascinating pursuit. It was in 1880 that I first witnessed an ascent, and got to know some of the aeronauts of the day. In that year I joined the Aeronautical Society,—which, by the way, was then rather laughed at, because the members would talk in a dreamy way about flying machines instead of devoting themselves to the practical and existing appliance, the balloon! But it has outlived all this, and, founded in 1866, remains to this day as the premier aeronautical institution in the

world. About this time the "Aeronautical Club" was formed as an offshoot of the Society. This, however, did not last long. Some half-dozen members used to meet of an evening at a room in Conduit Street to discuss matters in an unconventional way. We had several interesting talks, but this sort of thing soon palled on one. We had no funds to do anything more, and talking, if cheap, becomes nasty after a time.

Next a fillip was given to the matter when Commander Cheyne came forward with a scheme for going to the North Pole by balloon. Several ascents were organised with the idea of testing the suitability of balloons for arctic use, and during this boom "The Balloon Society" was started. This came in with a flourish of trumpets, was well advertised, and held

many well-attended meetings. But it was badly run, and rapidly deteriorated. After a few years, during which the Society lost nearly all its more prominent members by resignation, it became nothing more than an agency for popular lectures on any topic that might be going, and it soon afterwards died a natural death.

In 1881 the subject began to grow in interest, military ballooning was for the first time in England being developed, and Captain Templer was making a name for himself. Colonel Brine, R.E., then took the matter up (as an amateur), when Mr Walter Powell, M.P., also came upon the scene, made a number of ascents, had a fine silk balloon made for himself, and then, just as everything seemed to be prospering so well, he was most unfortunately carried out to sea and

was lost. Nothing daunted, next year Colonel Brine made several attempts to cross the Channel; but bad luck, or bad judgment of the meteorological conditions, intervened, and he had to descend in the Channel and be picked up by passing vessels.

In 1882 Colonel Burnaby, who had already done a good deal in the aeronautical line, and was on the council of the Aeronautical Society, succeeded in crossing the Channel in a balloon. This created further interest in the subject. Sir Claude de Crespigny hired Mr Simmons's balloon to attempt a similar feat, but an unfortunate accident at the start, in a violent wind, resulted in a broken leg and other injuries to Sir Claude, and Mr Simmons was shot off into the air by himself. A remarkable Channel crossing was the result, for the aeronaut stated that

it only took him twelve minutes to go from coast to coast! This would imply a rate of fully two miles a minute, or 120 miles an hour.

In 1883 quite a number of Channel crossings were made, — Mr Simmons going with Sir Claude de Crespigny from Maldon to Holland; Colonel Brine getting over at last from Hythe; Simmons and Smale from Hastings; while two or three Frenchmen came across from France.

About this time I thought circumstances were ripe, and with one or two friends tried to start a "Balloon Club"; but although about a dozen expressed a willingness to join, the thing was never regularly started, since not much could be done with so small a membership, or rather with so little capital behind it.

Later on Colonel Brine got together

a "Balloon Committee," and though this remained in existence for some years it was never able to accomplish much, and ballooning as a sport practically died out for the time.

I was now one of the few amateurs left still taking any active interest in the subject, and the two following papers tell of some of the incidents of that period. The Rev. J. M. Bacon then came forward as an ardent and a scientific aeronaut, and made many ascents; but he, too, is gone! In 1899 I dropped out of the scene while away in South Africa for nearly three years, and returned to find a new order of things.

About the first of what I may call the modern school of balloonists was Mr C. F. Pollock. He has made a great number of ascents, with professionals and alone. Then came Mr

Frank Butler and Mr Leslie Bucknall, who both purchased balloons of their own; while the Hon. Charles Rolls, Professor Huntington, and others soon followed suit.

The French Aero Club was founded in 1898 under the auspices of the Automobile Club, and proved a distinct success, so that the example was shortly afterwards followed by some members of the English Automobile Club, with the result that the "Aero Club of the United Kingdom" now flourishes as none of its predecessors has ever done. Even ladies have come forward as members, and the Hon. Mrs Assheton Harbord (with whom, by the way, I had a very agreeable trip quite lately) has now actually got a balloon of her own.

Such, then, is a rapid outline of the history of modern ballooning in

England, and it may be asked, What will its future be? Will the craze die out, or has it "come to stay"? Although there may still be much of interest to be done during the next year or two with this cumbrous and unmanageable contrivance, yet I feel convinced that we are on the eve of very great changes, and that within a few years the uncontrollable balloon will be as much out of date as a stage-coach. But a phœnix will arise in its stead, more practical, more extended in its application, and likely to appeal to a far larger proportion of the community. Already motor airships are obtainable, but for many years past I have been convinced that the "gasless" flying machine, the "heavier-than-air" machine as the French (not very aptly) term it, is destined to oust the gas balloon, and this subject

has quite recently come prominently before the public. Luckily the Aero Club has a name which does not confine its scope to ballooning alone, and we may hope to see it prosper as the home of the aerial sportsman, whatever his craft may be.

Elsewhere I have aired my views (necessarily crude and embryonic) on the machine of the future and its application, but here I confine myself to the past of ballooning pure and simple, and to reprint what I have already published on this particular subject.

The first paper is a *résumé* of an article published in 'Temple Bar' of March 1887. The second is a reproduction from 'Blackwood's Magazine' of November 1895. The third is an account published in 'The Car' of October 24, 1906. (All these are re-

produced by the kind permission of the respective publishers.)

I have added, as a fourth paper, a series of notes made at various times on the practice of ballooning. This, if not very complete, may be useful for beginners, since, except for a few details in the official military manual and a short chapter in Wise's 'Aeronautics,' no guide to practical ballooning has ever, I believe, been published in English.

It will be inevitable that, in reproducing these articles, written at such different times and with different objects, repetitions may occur, for which I can only crave pardon.

HOW I LEARNT BALLOONING

human beings, creatures of their own sort, whose fate is bound (by a few ropes) to that bubble. . . .

One wet afternoon in June a very heavy shower had just passed over, and as I emerged on to the bedrenched grounds of the Crystal Palace I feared that once again I was to be disappointed, as the balloon must have been beaten down under so heavy a downpour. But to my delight I soon descried the balloon bolt upright, nearly full, not a bit the worse for its severe ducking. Soon after I had approached the balloon we saw the police pushing their way through the crowd around, followed by "a member of Parliament," whom Wright, the aeronaut, was proud to have the honour of taking up. So poor Walter Powell (who afterwards met with so sad a fate), Wright, and I got into the car, and — we were far

above the cheering crowd before I could realise that I was actually up in a balloon! The excitement of the last few minutes on earth was enough to confuse a mind unaccustomed to public ascents. The rolling about of the car on the ground; the ballast bags being tossed in and out; the shouts of the aeronaut, and the counter-shouts of those assisting; then the final shout of "Let go!" and the burst of vociferous cheering, followed by the sudden perfect steadiness of the car, the rapid lessening in the intensity of the sounds, and a slight giddy feeling at being whirled up so fast,—all this had a strange effect on one's mind.

That Palace lately so huge and grand now looked like a miniature model. The roads and houses for miles around could be seen. Faint cheers and cries of "ball*oon!*" from all sides, barking of

dogs, rumbling and whistling of trains, greeted our ears. A little train just underneath us had the appearance of a caterpillar crawling along a dark line. Suddenly, to my astonishment, it entirely disappeared! I could hardly believe my eyes. There was a train, and the next moment it was not! There were no trees in the way; the country looked perfectly flat, as a map. But soon I understood, for presently the little train reappeared farther on. It had only passed into and out of a tunnel!

Look at the Isle of Dogs and the shipping — the Thames running right away into the mist. We pass over Chiselhurst, and are admiring a lovely cloudscape to the south of us, when the aeronaut proposes returning to earth. We accordingly descend to within a few hundred feet of a field, where some

cricketers are engaged in a group on the pitch discussing some knotty point. We shout. All start and turn in different directions—none think at first to look up. However, we soon pass on, and are over another field.

"Now look out. Hang on *tight!*" shouts the aeronaut, as he pulls open the valve. The sensation of coming down is rather sickening. The ground appears to rise rapidly towards you; objects suddenly grow bigger and bigger; and yet you are moving along, and everything which hitherto seemed so peculiar regains its ordinary look.

Sackfuls of ballast are now poured out, and soon we come crash into the top of a tree. We clutch tight to the basket to prevent being thrown out; we bound off into another tree,—the grapnel holds, crowds of people run up and we are hauled down, and the

balloon towed to a grass field. We alight, and our "bubble" is emptied and packed up.

The "Balloon Society" determined to give a "Balloon Garden Party" at Lillie Bridge in 1881, and hired Simmons, the professional aeronaut, to make an ascent in his new india-rubber balloon. I at once secured a place in the car, and was early on the scene. The wind was rather strong, and the weather threatening.

The tumult at starting was great. The balloon was tugged and bumped by the people, and tossed violently by the wind, as it was towed across the ground to get a clear start. However, at last up we went, and soon found ourselves looking down upon London. What we looked upon was no bird's-eye view, but to all appearances simply a map. Every street clearly marked out;

the plans of all the large buildings plainly discernible; the parks and squares and the Thames spanned by its bridges were all distinctly traced, although we were at such a height that human beings were almost invisible.

Shortly afterwards the clouds began to gather round us, dark and threatening, in parts quite reddish-brown; a mist cloud below us, a faint blue sky above. We found it cold. Moisture appeared on the ropes below the neck of the balloon.

We then descended again below the clouds. We were over the country—we knew not where or how far from London. We had gone due east, so supposed we would be over Essex. And now for an odd coincidence.

Directly below us was a large building. I looked at it long. Something seemed strangely familiar to me, al-

though of course the building appeared simply as a plan. Suddenly it dawned upon me this must be Warley Barracks, where my militia regiment was stationed! The descent was rather amusing. Simmons uses a very small grapnel—much too small, in my opinion. We came down with a tremendous bump in a field, and the car seemed to turn completely over; some green bushes even swept our faces. The next moment we rose, and fell again in the next field. The grapnel caught in the hedge, but dragged through it. The next field was all potatoes. The grapnel dragged through these also, gathering them up till they looked like a bundle of weeds tied to the rope. A rustic running up to help to stop the balloon tried to do so by jumping on this bundle. The next second he was flat on his back. We gave a merry chase across country, but

were eventually caught by the sturdy arms of the natives and very hospitably received at Hutton Rectory, and regaled on cake and sherry.

The Volunteer Review at Brighton was shortly to come off, so I asked Simmons to take his balloon down, that I might make an ascent. He accordingly agreed to this, only stipulating that the balloon should first make a series of captive ascents—a condition I ultimately agreed to—to take up newspaper correspondents, artists, photographers, and others. But another stipulation, proposed by Mr Simmons, did not find that hearty response that it should have had from me—viz., that I was to pay as much as if I had the sole use all day. However, I saw the Review very well. But the wind came on strong; the "captive" was swaying about a good deal. I was alone in the

balloon, gazing through a field-glass. Suddenly I noticed a peaceful calm occur. The shouts, which had been perpetual, seemed to die away. I began to suspect something. I looked down the rope, and there, some hundred yards behind me, I saw the contingent of Naval Volunteers, who were supposed to hold the rope, all lying on their faces. The balloon and I were floating away free! There was not a moment to be lost. The neck of the balloon was tied up; if it ascended high it must burst! The valve line was tied up inside, so that I could not let off gas to prevent ascending! I had no grapnel to stop my way. It did not take many seconds before I was up in the hoop, and had reached the neck to untie it. I felt glad of one thing, and that was that we were not ascending very fast. I looked down, and then I noticed that

the end of the rope was still on the ground. The balloon had not sufficient power to lift all the weight off the ground. I at once shouted, at the top of my voice, "Hang on to the rope!" Some men did so, and we towed back to empty and pack up. But the emptying process did not take long. The balloon was very much "caved in" with the wind, the valve line chafed against the stuff, suddenly a small split appeared in the middle, and in a very few seconds the balloon was lying rent from head to foot.

I was in Paris when a new invention was to be tried, the object of which I never could understand, nor could I discover that the inventor himself did. The apparatus consisted of a huge wooden oar shaped somewhat like a Japanese fan; a rowlock was fixed to the car of one balloon, and another of

similar size ascended at the same time, apparently to race the one provided with this marvellous propelling (?) agent, but itself to be wafted in the old and primitive fashion by the changeful breeze. Such a sight as the start I have seldom seen. A balloon ascent may be an exciting event; the aeronaut and those around are often very excited; but on this occasion every one admitted to the enclosure seemed to have gone entirely off his head. Each one fancied that he was managing the whole affair. Every one was shouting, every one giving orders, every one hanging on to the balloon, every one wildly excited. The balloons went up, ballast was immediately poured freely over every one's head, and the result was distinctly amusing. Some of the men were fearfully enraged at a little sand being thrown on their hats, others laughed,

and the remainder shrugged their shoulders. One balloon went right up several thousand feet; the other did not rise more than a few hundred. Of course they got into different currents. The oar was worked violently, and we watched carefully for the result. The balloon certainly began to turn slowly round, but of course it did nothing more. Whether the inventor expected to see the balloon propelled along against the wind, or what he expected, he did not say.

Two years afterwards, happening to hear rumours of a marvellous navigable balloon being constructed by the military authorities in Paris, I went to Meudon, where is the establishment of the military aeronauts, and was surprised and delighted to behold a fully inflated monster with a long car and big screw attached, which some months

afterwards rose to spread its fame around the globe, as the first balloon which had made a voyage in a given direction and had been propelled back to its starting-point.

Having thus served my 'prenticeship, and seen what most other people's balloons were like, I determined upon becoming owner and captain of my own vessel. Accordingly I bought the good balloon "Eclipse," of 28,000 cubic feet, and set to work to fit her up after my own fashion. I engaged Mr Wright to arrange the first start (at Aldershot), and employed some soldiers of my company to assist at the inflation. After an enjoyable voyage we determined to descend, came down with a good bump in one field, and bounding over a large hedge, in which the grapnel took a firm hold, landed softly in a grass field. A pack

AN ASCENT.

of harriers immediately surrounded us, and looked rather surprised at the huge, strong-smelling monster, while some rustics puzzled us with their anxious inquiries. "Had an accident?"—"No." "Lost your way?"—"No." "Then why did ye come down here?" The balloon was soon packed up by willing hands, not without some merriment; especially after I had requested a small boy to be so good as to get inside, which he willingly endeavoured to do. Those only who have experienced inhaling a good mouthful of gas can appreciate the poor lad's sensations.

Next time I went up I determined to manage the whole thing myself, assisted as before by some of my men. The day was, as my sergeant described it, very "blusterous." Just as we were about to start, my companion's thought-

ful servant pushed his way to the fore, and with tearful eyes requested that before we went off he might have his book settled up. We shot away at lightning speed, and almost before we could look round we were a mile from our point of departure. But on getting up to about 4000 feet our pace became more moderate. We saw a curious phenomenon. It is not unusual to see the shadow of a balloon, with halo-bedecked car, on solid clouds, but on this occasion it was thrown on a thin mist between us and the ground. The result appeared like a huge shadow on the actual fields and woods below. The hills, generally indistinguishable from a balloon, stood out clearly above the mist.

We had an exciting descent. A "guide-line," about 1000 feet long, with a flag at the bottom, told us

that the wind below was blowing at a different rate from what it was above. This line has a curious appearance when looked on from above. It hangs quite straight for several hundred feet, and then bends out, apparently almost at right angles. A large open piece of ground, seemingly half a mile across, lay before us; beyond that several woods. Now I had always learned from aeronauts, "Whatever you do, avoid trees and woods; come down in the open." Down we came. We now saw that we were driving along at a tremendous pace. This is a most alarming sensation. You are going along (perhaps fifty feet up) over the ground like an express train — quite quiet and safe — but you know that directly you touch, never mind how gently you descend, you *must* get a tremendous bump — like jumping out

of a train at full speed. Also, that the bottom of the car will be the first point to touch, so the result will be that the car *must* be violently upset.

I throw out the grapnel—the bump comes, hard and cruel—we are rolled over, car and all; but we hang on tight, neither of us is any the worse, and the balloon bounds upwards again. The grapnel gives a tremendous jerk and jumps off the ground, which is as hard as can be. It then bounds along, now and then catching for the moment, but only to communicate a good tug to the balloon. It is, however, a good test that the cable is all right. We can do nothing but hang on. I am hauling on to the valve-line hard, with my arm round a car-line, so as not to be thrown out. Suddenly we dash right into the bushes of the

wood! We tear through them. The balloon seems like a maddened horse dashing on to destruction; but the anchor cannot follow through the wood. It holds tight; we are safe! and a great feeling of relief comes over us. My companion gets out, and we try our best to tow the balloon out of the wood. But it won't move an inch; the cable is like a bar of iron, so strong is the pull of the wind, which has increased greatly since our start. The grapnel is half buried in the bank in which it caught. With a sorrowful feeling I proceed to let all the gas out. People collect, the balloon is lying spread out on the tree-tops; how can it be got down? A woodman is fetched, he makes sad havoc of the covert with his axe, and then altogether we forcibly drag the poor aerial steed down through the trees: each tug must have caused

him excruciating pain, the horrid branches and sticks tearing open his skin. He is laid in his car and solemnly carried off.

The day after a post-mortem examination is held. He certainly has two very bad wounds, and several small ones; but two days' work, and they are all neatly sewn up and healed: he is all the stronger. I found after the balloon had been packed up that my aneroid was gone. We searched about the wood in vain, but I left word that if found I would give a reward for it, with the result that more than a year after I was surprised to receive by post the instrument, somewhat the worse for its long exposure.

My next balloon trip was short but gentle. Two brother officers were to accompany me, but the gas supplied was of so poor a quality that bag

after bag of ballast was put out, and still we didn't rise. At last, with ballast reduced to one small bag, we ascended slowly. But we had not gone far when the "Eclipse" seemed to think she had had enough, and down she came again. It was no use. We could not attempt a journey without any ballast at all, as it is most necessary to have plenty of sand ready to discharge, to avoid coming down in awkward places, &c. It came to a toss up, and one passenger got out. More ballast was then shipped, and we rose up well. On reaching 4000 feet the thermometer had fallen twenty degrees, although we were basking in a warm sun. At this height we could distinguish Southampton Water in the distance. We travelled very slowly, and after an hour and a quarter had only gone eight miles. I gained a

curious bit of experience on coming down, due to the dead level at which all things appear to be when seen direct from above. Below us was apparently a flat common. We descended gently. I threw out the grapnel, which began to drag through the bushes and furze. I then opened the valve to let out the gas, but, to my surprise, instead of our continuing to descend, I saw the anchor, trailing at the end of the cable, suddenly leave the ground; and on we floated, over some trees, in which the grapnel caught, and down we came, after making two or three shots for an open space, through the trees, to the ground. I found afterwards that the cause of all this was that the ground, instead of being level, was hilly. The place where we first touched was the top of a small hill, beyond which was a deep

valley, over which, as it were, our grapnel jumped.

At Aldershot, during the Ascot week, the idea occurred to me to visit the course in my balloon. There were several applicants for seats, but it was very doubtful if the wind would be favourable. However, one morning that week I was awakened by the hopeful words, "The wind is right for Ascot." Up I got, and made observations with my anemoscope and map. The wind below was certainly very nearly right in direction, but there was no gas in camp with which to inflate a "pilot" to test the upper currents. The clouds, however, which completely covered the sky, were being borne a little more to the east. In another hour or two the "Eclipse" was imbibing her gaseous meal, but managed somehow to get her neck caught in the

main. When about half full there was an ominous smell of gas. Suddenly the sergeant shouted: "Here's a hole, sir; and a big one, too!" My heart jumped as I hurried round and discovered a huge rent, eight feet long and one foot across! We gathered the edges together, and roughly but readily sewed up the gash. The net too was caught in and tied, so as to make the strain equal. Luckily the hole was low down, so the pressure would be comparatively slight. After this delay Mr C. Balfour, of my regiment, and I ascended, and we were not long in reaching the clouds. It was easy to see that in ascending to this height our course changed slightly to the eastward, yet not sufficiently, we hoped, to land us far from the course.

The mists now closed around us. We steadily mounted up. The sun

appeared, the gas warmed, and we rose above the bed of clouds. Our shadow was well thrown on the wavy surface below, but gradually became smaller and less distinct as we mounted. It was now a glorious scene. "Silence reigned supreme." The hot sun baked our backs. The sky was deep blue, and the clouds below appeared as a brilliant white sea, with distinct horizon all round. Nowhere could a glimpse of the earth be seen, or any object to tell us how fast we were travelling, or in what direction. It was a lovely sight, and much appreciated by my companion. But I could not help feeling fidgety. The balloon was tightly distended. Was there any chance of the wound bursting out again? Where were we drifting to, and how fast? It might be out to sea for all we knew. Then how quickly should we fall when

passing into the cold clouds after this hot baking in the sun?

Presently we hear the report of a gun. Are we still over the ranges at Aldershot? Then we hear a lot of shouting and cheering. "It must be Ascot!" I open the valve. "Flap—hisht!" Again the same, till we notice a decided downward turn. Soon we observe our shadow on the clouds increasing in size, and then, apparently without sinking into them, mists gather round the balloon. It becomes darker and darker, and colder and colder; a ghastly feeling comes over one. Down and down we go till the darkness seems wonderfully intense, contrasted with the very bright sunshine and light-reflecting clouds we have just left. Nowhere do we seem to be *in* the cloud. It is merely very dark, and there is no view. No trees or houses loom through the

fog to give one an idea of distance. This cloud, moreover, is quite dry; even the breath is not made visible, as on foggy days. Added to the horror of this dismal descent one hears a rustling sound, and on looking up one notices the balloon collapsing (owing to the cooling of the gas), the envelope twisting and shaking, and apparently rapidly becoming empty. One cannot tell that it may not be owing to the escape of gas through some large hole above! But there is not much time for these meditations. All at once a dim sight is caught of the old earth. How common and prosaic it looks as we descend below the clouds! We are rapidly approaching a large park full of trees. We are going right on to them. But after my past experiences I feel glad rather than otherwise. We are descending very fast and the trees

will break our fall, while the anchor is sure to take a good hold. Over goes the ballast, and out goes the grapnel, as we want it to catch in the trees we are now just over. But it is a little too soon. We are too high yet, and the grapnel falls to the end of its tether, when a terrific jerk is felt, and a wounded finger is the only result of my trying to act as a buffer to prevent the sudden strain on the cable. However, the next moment the anchor is caught, and the car dashes into the top branches of an oak-tree. We are now safe. The next thing is that the balloon too may be made so. We rise again out of the tree, and are blown about like a weathercock. We get over a clearing; open goes the valve, and down comes the balloon. But it is a bad shot; the wind has taken it too far, and we are in the top of an-

other tree. Again the manœuvre is repeated, and the gas becomes so exhausted that one of us must get out. My athletic companion at once swarms down the rope. Plenty of men have now come up; the grapnel is loosened, and the balloon is very soon towed to an open part of the park.

"But where are we?" To our great surprise we are informed that we are at Albury, the Duke of Northumberland's place, and the Duke himself is looking on from his carriage. So instead of being near Ascot, we must have turned in the upper current, and so descended on the other side of Guildford!

The "Eclipse," still holding sufficient gas, is made to carry up captive several of the onlookers to see the park from above; but one gentleman, with the most praiseworthy caution, whilst keen

to make the ascent, sat on the bottom of the car, and declined to look over its edge when in mid-air. After a very hospitable entertainment the Duke sent us to the station, the balloon following after.

My next ascent yielded a new excitement. We tried filling at a different place in the gas-works. A valve in the main was taken off, and the neck of the balloon put over the actual main, so that there was at once a splendid rush of gas with great pressure: there was, however, no means of turning it off. The balloon at once began to fill up well. As it became nearly full I turned to see to the car, leaving the gas arrangements in the hands of the gas-works manager. I had arranged the car, and turned to see how the balloon was getting on. To my horror I saw the old "Eclipse" standing up

tight as a drum, looking as if she were being throttled! I thought of the big rent but roughly mended, of the great pressure of gas there must be, and I quite expected to see the whole thing go "pop." I rushed to the neck. No possibility of turning the gas off! and of course the neck was very tightly bound on. It was a painful moment, but I had a knife ready in the car, and by cutting the lashing we got the neck off at last, and a roaring stream of gas rushed up from the main, but now only into thin air. Thus filled, we towed the balloon a mile across country to the North Camp, and made a series of captive ascents, a party of our men holding the rope. Some twenty-six journeys aloft were made during the day.

A TRIP HEAVENWARD

ON AIR BALLOONS.

"OUR learn'd Divines their Flocks advise,
By fervent pray'rs to seek the skies;
The Aeronauts, with less devotion,
Contemn this antiquated notion,
And strive with songs and merry tunes
To float to Heav'n in AIR BALLOONS."

—L. H. HALLARAN (1789).

A TRIP HEAVENWARD.

In theory no experience that we poor non-flying mortals can enjoy is more fascinating, more ideally charming, more poetically sublime, than a trip heavenward in that curious, unnatural, and yet extremely simple apparatus—a balloon. To soar aloft, rising up and up without rocking or vibration. To glide o'er the country, above the tree-tops and houses, perfectly noiselessly, perfectly at ease. To gaze on distant views, on glorious cloudscapes, and have the earth laid flat beneath one's feet! Surely one's wildest dreams can conjure up no more

perfect mode of motion. Even the very notion of rising up out of this world of busy hurry, to remain for a time quite beyond the reach of man, and then to return somewhere — no one can say where! Is not there a poetic charm about even this glorious uncertainty?

But, as usual with all mortal joys, we have to look to the practical as well as the theoretical aspect of the question. And of what does our balloon journey consist? Usually we are first confronted with the prosaic monetary and business questions. We have perhaps to make our arrangements with a professional aeronaut, and he is probably not much less grasping than any ordinary inhabitant of the earth. Then the chances are we cannot choose our own time and place, but have to be packed into the very crowded-up basket, with

two or three strangers, at an appointed time. And, above all, comes that great bugbear to all our unalloyed happiness —the fear of danger. We can only throw ourselves on the hands of the aeronaut in charge, trust all to him, place our life in his keeping, and simply hope that he is trustworthy.

On the other hand, there *are* more pleasant ways of accomplishing our object. Soldiers may go in for military ballooning, and during their course may go many a free trip without such inconveniences as just described. Or again, after we have gained some slight experience, and have confidence in ourselves, we may, if we can afford it, buy a balloon of our own, and go up when we will.

Personally, I have tried all three methods, and though, of course, the last is by far the best and most en-

joyable, one or other of the other two is a necessity, in order that we should be able to manage our own vessel.

I think, too, that several trips must be undertaken before we can thoroughly enjoy the experience. Those who have made but one or two balloon ascents can hardly, unless they be of an extraordinarily calm and careless nature, realise the enjoyment of a trip when all such adverse elements as fear and trepidation are eliminated from the pure sense of enjoyment. And it is indeed not easy to be entirely rid of a nervous anxiety under the circumstances of a balloon journey. It is a feeling natural to man to be afraid of being up at any great height above the ground. Be he ever so firmly secured to ever so strong a support, he will be apt to feel an inward shrinking if there is nothing except his fastenings between him and

the earth, some hundreds or thousands of feet below. And when this feeling is present, nothing but familiarity with the position can master it. But there is also another sense of danger, of a more mental and reasoning origin. The novice will ever be questioning himself as to the strength of the ropes which support him, the chances of the balloon bursting, of the bottom of the car falling out!—and though he may soon convince himself that if only the balloon is thoroughly sound and well made, there can be but little danger, yet he will recall to mind accounts he has read of numerous terrible balloon catastrophes; and it is true there is here good fruit for reflection. For undoubtedly many serious accidents have taken place, and, moreover, many in proportion to the number of ascents. Hence people think the pastime (or

business) a dangerous one. But it is not so black as it is painted. If we inquire into the balloon accidents of the past, we find that, with perhaps two or three exceptions, every serious accident has been caused by gross mismanagement, either from ignorance or carelessness.

Again and again we read the same sort of story. Some uneducated, ignorant man, probably through utter lack of capacity to get on in other walks of life, announces himself as a professional aeronaut. Not usually having any very large credit lying waste at his banker's, he economises by purchasing his outfit at the lowest possible figure, which means that either he buys some old balloon in a very doubtful state of soundness, or he sets to work to try and manufacture the article with his own inexperienced hands. Then, with

flaring announcements of most daring and sensational feats, he starts his show. A few times he may succeed, but what is more probable than that sooner or later he will have some accident?—and this has occurred over and over again.

I can relate a curious little bit of history illustrative of this, which has only lately come fully to my knowledge. Some years ago I bought a balloon from a professional aeronaut. Though not a new one, it was sound enough for my purpose. I used it for several ascents, knocked it about a good deal, had it patched and altered, and finally stowed it away for some months in a cellar. After that I knew it was probably not trustworthy, and therefore determined to get rid of it. I asked the maker to buy it back as so much old material. Of course he was only too ready to agree that it was utterly

worthless as anything else, and so I parted with it for a few pounds. Some time afterwards I happened to hear that this very balloon had made another ascent, and I therefore ventured to remind the aeronaut of the exact nature of our transaction, recalling the fact that the price he paid me was not the market value of a serviceable balloon, and I presumed to advise him against the risk of trusting his life and limbs to such utterly worthless old material as he had described it. Then, it seems, he took the matter to heart, and, like me, thought it best to be rid of the thing. So he sold it (history breatheth not whether as "old material" or not) to another professional named Dale. This man, emulating the magician in Aladdin, had a great invention for converting old balloons to new ones. He took the old "Eclipse" and put it in

the pot, and boiled it down with soda and other chemicals, till all the varnish had disappeared, and left a mass of snow-white cambric, as clean (if *not* quite as strong) as it was on the day it was born. He varnished the stuff afresh, and then turned out a splendid-looking balloon, quite unrecognisable from the good old "Eclipse," which had its name in "life-sized" letters painted on it. Some years after, a young naval reserve officer in India became possessed of some idea with regard to balloons and parachutes for military purposes, and with the intention of putting his theories to a test, sent home for a balloon. Dale had the very article for him, and shipped it off at once. Poor Mansfield made his first ascent at Bombay; but ere he had attained an elevation of 200 or 300 feet, the balloon burst asunder and fell

to the ground, the unfortunate aeronaut being fatally injured. Meanwhile poor Dale doubtless thought he had found the elixir of life for balloons, and prepared a second old balloon in the same way, and, what proves that he did not realise the danger or intentionally commit so awful a blunder, made an ascent himself in it, accompanied by his son and others. This balloon acted in just the same way as the first, bursting ere it was clear of the Crystal Palace grounds, and dashing to earth its human freight,—Dale and one of his companions being killed, the others dreadfully injured.

Ballooning is so little understood by the general public that accidents of this sort are vaguely attributed to the danger of the practice, without any inquiry as to the exact cause. Aeronauts and their balloons should both

be officially certificated, or not allowed to ascend. If this were done, as it is with ships, we should be less often shocked by accounts of appalling disasters.

Of course the practice *is* to a certain extent dangerous, and accidents *will* happen in the best-regulated balloons. But, then, are not the streets of London dangerous? There have been many cases of quiet, cautious persons being seriously damaged, and even killed, by hansom-cabs and vans. And the best proof of my contention that there is no such very great danger about properly managed ballooning is in the statistics of the ascents of the most reliable aeronauts. Old Green, who made in his day some 2000 ascents, probably a greater number than any other man, never met with any serious accident. Coxwell, a good second to him, and a

man of quite a different cut to the average professional, remains intact and uninjured to this day. Then, take our military school of ballooning at Aldershot, than which no better regulated establishment of its kind has probably ever been organised. Here many hundred ascents have been made without any mishap of more than a trivial nature. Exception might possibly be taken to this statement, in the case of a military captive balloon being struck by lightning last year at Aldershot. But the same injuries might have been caused by the utilisation of a church steeple, or any other elevated post, as an observatory. It cannot be classed as a purely ballooning accident.

A balloon trip may be divided into three phases—the ascent, the journey in mid-air, and the descent—of which the last is by far the most dangerous.

On a calm day a balloon will rise straight up without any difficulty if a proper amount of "lift" has been provided. On a windy day there is more danger. It may be (and often has been) blown against a tree-top, or, worse still, a house-top; but this (which is not, as a rule, dangerous to the aeronaut) would be entirely due to misjudgment. The careful aeronaut knows that on a windy day he *must* have plenty of spare lift, and *must* have a clear space for some way to leeward. With a sufficiency of these he cannot come to grief in the ascent.

Somebody once said he didn't mind falling from ever so great a height. All he minded was bumping against the ground at the bottom. Just so; but it may quite seriously be said that there is little to fear from ballooning while up in the air: it is only the

descent to earth wherein the danger lies. A balloon might, under certain circumstances, burst in mid-air; but such a contingency is not likely to happen to a well-found and well-piloted machine. And if it *does* happen, it may surprise some people to hear that not only is it by no means sure to end in disaster, but that it is not even likely to do so. Balloons have constantly burst in mid-air, and the shattered envelope, supported by the network, has formed itself into a parachute and let the aeronauts down gently to the ground. Indeed so sure is this result that an American aeronaut, Wise, used on many occasions to ascend and purposely burst his balloon at a great height, by way of giving a novel sensational exhibition. It is true that this result cannot be depended upon if there were less than a couple of hundred feet or

so to fall (as in the accidents just referred to), as the material would not have time to arrange itself to resist the air; but then the only cause for a balloon to burst *should* be owing to the rarefaction of the air at a great height.

Nothing much else can happen to a balloon once risen clear of earthly obstructions. Such notions as falling out of the car (which need no more occur than falling out of a boat, indeed not so much), the ropes or netting breaking away, &c., may all be put aside as beyond the range of practical and properly regulated ballooning.

It is a vast pity that the most dangerous time for the balloon traveller is at the end of his journey. The knowledge of this is apt to haunt his mind all through the air, and detract greatly from the free enjoyment of it. And yet as often as not the descent

may be accomplished with the greatest of ease. On three or four different occasions I have been hauled to the ground by throwing out a rope to those below, while gently floating along above their heads, and thus have come to ground without the slightest concussion or danger. On other occasions, when it has been blowing rather hard, or on descending very quickly, I have purposely landed in a tree-top, the twigs of which act as buffers, and from which it is very easy to extricate the balloon when its "way" has been taken off.

There is a simple appliance attached to some balloons called a "guide-rope." It is nothing more nor less than a long rope, anything up to 1000 feet in length, suspended from the car. When the balloon descends, the end of this rope trails along the ground: the lower the balloon comes, the less is the weight

of rope to be supported by it, which is therefore equivalent to the discharge of so much ballast. If the balloon is inclined to rise again, it has to lift off the ground more weight of rope, and thus the height of the balloon is automatically regulated. If only this could always be used, it would both increase the "life" of the balloon—that is, the length of time it can stay up—and greatly lessen the danger of the descent. But unfortunately it can seldom be used, being apt to damage property on "earth beneath." I have sometimes run some miles across country with a trail-rope, keeping, say, between 10 and 50 feet above the ground. It is a delightful sensation to travel along at a rapid pace, skimming over hedges and ditches, across roads and rivers, and conversing casually with passers-by. One might travel thus for miles

and miles, and could make a balloon journey last very much longer than is usually the case, since there need be but little loss of gas or ballast. But unfortunately this system can seldom be practised in England. After a few miles one always comes across a house, a farm, a line of telegraph, or some other obstruction, which necessitates our discharging ballast and rising above all earthly ties. On one occasion I passed over a farmhouse with a 1000-feet guide-rope trailing below. I was unable to rise sufficiently fast to avoid striking the house with the end of the rope. The surprise of the inmates on hearing the raps on the walls and windows, and the rattling of the rope on the roof, can well be imagined, though I believe no further damage was done.

As I have said, the guide-rope renders a descent much more agreeable and

safe, since, if travelling fast, the friction of the rope trailing on the ground acts as a brake, and with greater power as the balloon gets lower, and a greater length of rope rests on the ground. And then, when it is desirable to stop, the rope can be seized by men below, or the grapnel let down the rope, and the balloon be brought gently to anchor.

And this leads me to discuss the uses to which balloons have been and might be applied.

They that go up in the air in balloons do so, or say they do so, for certain various reasons. There is the really scientific man, who ascends with some fixed purpose to ascertain empirically some undetermined question of science. There is the soldier, whose object is to practise looking out from his exalted observatory for an enemy, or to note the features of the country before him.

Then there is the ordinary amateur, the man who goes up chiefly with the object of being able to say he has undergone the novel experience. Finally, there is the professional, whose main object, as already intimated, is generally the acquisition of filthy lucre.

As for the first of these, he is rather a *rara avis*. Specimens have often been seen. Everybody has heard of Glaisher and his purely scientific ascents, which have been of the greatest value to meteorological science, and much still remains to be learnt by the careful observations of instruments at great heights above the earth. But meteorology is not the only science that may be furthered by this means. Jules Verne's stories all savour much of prophecy; but none is more probable, or rather more possible of attainment, than the journey across Africa

in a balloon which he describes so well. Balloons have been tried, too, as a means by which to reach the North Pole. And, indeed, it seems to me, if there really is any desirability in arriving at that much-sought-for locality, the air is *the* road. A properly equipped balloon (and here is a chance for our guide-rope!) ought, provided only there is favourable wind, to make certain of getting somewhere near the desired goal. And with what is just as important, a certainty (bar accidents) of getting back, since whichever way the wind blows the balloon would be borne to warmer and more hospitable climes.[1]

Then as for the military use of balloons. Of course their usual *rôle* will be to be led about captive in the

[1] This was written before M. Andrée's bold but unfortunate departure by balloon for the Pole.

neighbourhood of the battlefield. It is remarkable that just a hundred years ago military balloons were much used in actual war; yet only within the last ten or fifteen years, although no very special improvement has been introduced, every great military Power, without exception, has suddenly adopted them as a regular and necessary part of its equipment, and has been employing them extensively in its manœuvres. However, captive work is very different from the free ascents about which I am now more particularly writing; but there are occasions also when such trips would be of much use in war. The escape of numerous balloons from besieged Paris (although scarcely to be included as pure military ballooning) proved of great importance. As an instance of what might be done in military reconnaissance in war, I will

relate what I saw myself at the commencement of our autumn manœuvres last year. Two battalions were supposed to be marching down from London to join a mixed force at Chobham, and these combined were to act as an enemy advancing on Aldershot. The whole division from the latter place marched out one morning and engaged some of the enemy near Pirbright; and after the field-day, during which the balloon had done good captive work, it was decided to let it go free. The wind was blowing from the south-west, so that the balloon would be likely to pass over Chobham and proceed in the direction of London, and thus valuable information might be gained, for at present we knew (or were supposed to know) nothing except that the enemy had retreated northwards, and that some body of troops

was supposed to be marching from London to their support. Everything went well. Ascending slowly, we soon got within sight of Chobham, passed directly over the town and near to the camp, in which not only could every tent be counted, but I was able with the aid of field-glasses even to distinguish the differences of uniform, so that it was possible to give pretty exact details of the men, horses, and guns in the camp. Then onward we went towards London,—not only the main road, but every lane in the neighbourhood, being carefully examined to see any column of troops on the march; but nothing was observed till we got near Hounslow, where a second camp was seen, with its ant-like masses of soldiery, showing clearly that a battalion had just arrived in the camp. But how, it may be asked, could the

news be conveyed back to Aldershot? This might, of course, be a difficulty; but as the balloon can be brought down at any desirable moment, pursuers can be easily avoided, the aeronaut may jump out, and even let go the balloon, which would continue its voyage, luring on the pursuers. Meanwhile the aeronaut with his report may have a difficult, but by no means hopeless, task to find his way back, eluding the enemy, which in a case like this, when they are on the march along main routes, should be easy. He will have noted, while in the air, farmhouses or other places where he may be able to obtain a horse, or may even have marked a friendly farm-cart on a road near by. And then he could return with the fullest possible report of the progress of the enemy. In a friendly country free balloon trips

might thus often be of the greatest value.

I must now refer to the third great object of balloon trips, which is *pleasure*. I might even call it a sport. It has become a sort of fashion, I don't know why, to always refer to a balloon trip as something scientific. The professional aeronaut has a way of dubbing himself "professor"; and if a man crosses the Channel or performs any other hazardous feat which might be called foolhardy, he always maintains that it is done purely in the interests of science. I never heard of ballooning being called a sport. Yet it is very like yachting and boat-sailing, with a dash of mountaineering; and even the latter is now often included under the heading of sport. And I maintain that, among those sports in which the object is not the pursuit of game, it stands

pre-eminent. To travel miles and miles across country, skipping o'er hedges and ditches, skimming up hill and down vale, continually encountering new glimpses of rural scenery, occasionally, perhaps, having a brush through a tree-top or a bump on the ground,—is not this as good as hunting? To drive along before a fresh breeze high in the air, to employ all the skill one can, by plying ballast-bags and valve-line, to prolong the journey and rise or sink as we desire, —is not this as good as yacht-sailing? Then, if only two balloons are to be got, what grand sport can be had by combining all this with the excitement of a race! For a good deal of dexterity is required to pilot a balloon so as to take advantage of the fastest wind-currents, or those moving in the required direction. As a sport, it is

fascinating, health-giving, mind-elevating, requires skill, and has a sufficient dash of danger about it to render it truly exciting.

As for ballooning as a profession I think I have said enough. I am not prepared to say whether there is any opening for a good man to go in for it; but I suspect it is a limited business, and there are some good men, such as Messrs Spencer, already well established.

But now, after all this preliminary talk, you—that is, you who have never undergone any experience aloft — will perhaps be anxious to try for yourself what it is all like. Or, on the other hand, it may be you would rather not; for I find that people nearly always are either very anxious to go up or else would not try it for any

money. Well, if you like to try, come along. Here is the balloon ready. The men are just taking off the last of the bags of ballast which have been hooked on to the netting to keep the machine down during inflation. Already the little basket in which we are to spend the next hour or two is being attached by its few stout cords to the wooden hoop where all the strings of the netting concentrate. And now your aerial steed stands before you ready for the fray. The light breeze gently sways the amber-like globe about its car, which is held fast to the ground by stalwart hands and by the weight of many sand-bags which have been piled into it. Now all is ready. Don't be nervous! It is time to get into the car. The valve-line is all right, for we have looked up the open neck at the bottom of the gas-bag, and have

seen it leading down from the valve at the very top. We have got its lower end, and have now roughly secured it to the hoop. Now clamber into the car. Come! that's not very graceful, knocking your hat off among the ropes, but no matter, so long as you are in. Sit down on the wicker seat. Yes, it is quite strong enough. Now, stow away your belongings. You seem to have a lot of them. Never mind; they can be thrown out as ballast! Take hold of a sand-bag, but don't do anything more till you are told. Now, then, everything ready? "Let go!" We are off! All the rocking motion, the creaking of the car, the various excited voices — all these have ceased. The earth sinks away from under us. Instead of a few people struggling close around us, we see a multitude of upturned faces. We have

risen to a level of the house-tops—ay, and more! For look at the view which is now spreading out around us: we can see miles in all directions. Well-known buildings and places are recognised as they might be from the top of some tower, and yet we are still going up! Look at the place we started from *now!* It has grown quite small. There is the little crowd with the circular space whence the balloon ascended. Do not mind that peculiar crackling in the ears; you will soon get accustomed to that. How still and peaceful it all is! It seems quite hot, since there is not a breath of wind noticeable to us. But now let us arrange the car. Oh, don't mind my moving about. The car *does* creak and tilt slightly, and it does seem rather as if the bottom might drop out; but you need not implore me

to keep quiet, — there is no danger. So never mind, but look at the view. We have travelled away from our starting-place, and are skimming over comparatively unknown country. See the roads, white and straight, the fields of green and brown, the clumps of trees, the country-houses in their well-planned grounds—all as in a coloured map. Now let us see what the aneroid says. It has fallen nearly 3½ inches, equivalent to a rise of 3000 feet. See how this hot sun has expanded the gas. The balloon is as tight as a drum. But no matter—it can stand it. How curious it is to hear the dogs barking, the children crying, and the many trains whistling! For we can hear every loud noise that occurs within several miles. We are still rising upward. See how faint the country appears to the north, and now it begins

to appear so all over,—it is all blue and misty. Why, it seems all to be dissolving! It is gone! Nothing is visible anywhere except greyness. We are in the clouds. It gets comparatively dark, and soon the balloon above our heads begins rustling and looks loose. Bits of paper thrown out mount upwards, showing we are falling faster than they are. Well, we don't want to come down yet; we will go above this cloud. What! you say you *want* to go down? Oh, it's all right. We'll just discharge a little ballast — half a bag, that's enough. See, we are already checked, and are rising again. It is getting lighter. A dim sunlight strikes us. Suddenly we realise we are in bright sunshine again, with fleecy white clouds below us, and a deep blue sky above. Look at the shadow of the balloon on the clouds!

See the light prismatic colours like a halo around the shadow of the car. Here we are all alone, in perfect silence, in the depths of a great abyss—massive clouds towering up on all sides, a snowy-white mass below. But no sign of earth—no sign of anything human. Not a sound, not a sign of life! What peace! what bliss! Horrors! what's that report? The balloon must have burst. Oh, nonsense; keep still, it's only a fold of the stuff nipped by the netting being suddenly released—that's all. Well, we are falling again, for see the bits of paper apparently ascending. And we must take care, for the coldness and dampness of this cloud will cause the gas to contract, and we shall fall rapidly. So get a bag of ballast ready, for we are already in the darkness of the cloud. Now the gas-bag shrinks

and writhes, and loose folds rustle together, and it gets darker. You can feel the breeze blowing upwards against your face or hand held over the edge of the car. Well, that's not to be wondered at, for remember we are falling, say, 1000 feet a minute, which is the same thing as if we were going along ten miles an hour sitting in a dog-cart. Not quite the same, you say? you'd sooner be in the cart? Well, perhaps if the horse were going straight at a wall, without the possibility of being able to stop him, you would think otherwise. But look! there is the earth appearing again, so out with your ballast. Go on! pour out plenty—there's no good economising. See how the sand seems to fly upwards, showing how rapidly we are falling. We are already nearing the tree-tops. We are into them, what's

more! Hang on now! and mind your hands or they will get scratched. Hish! the green twigs come in all around us, we crash among the branches, stop dead, and then the balloon, as if suddenly thinking better of it, lifts us with a tug right up again, and we are soaring away over a field. A little more ballast. That's it. We are just going over a farmhouse—see the ducks and chickens flying in all directions and making such a cackling. "Come down, come down!" we hear people shouting. "Come up here!" we shout in reply, though we have already passed over the house and are skimming along now pretty close to the ground, for a big open hill has appeared before us. We glide up the side of it and pass over its top. But now we will not, as you imagine, continue at this elevation: no, the wind will curl us down the far

slope to the valley below. How curious it seems to be gliding swiftly along thus, without the slightest noise, when even the rustling of the wind in the trees can be heard! Look at that covey of partridges flying along just underneath us. Oh no! they are some rabbits scuttling away as fast as they can run. To us aeronauts, ground game and winged game appear much the same. But see, there is a large village ahead of us. We must rise again, else some damage may be done to the chimney-pots. There is the town now laid before us—there is the church, then the main street, and the big mill in rear. What place can this be?—I haven't followed the map sufficiently carefully. We'll ask. There is a man standing in the High Street looking up at us. "What town is this?" we shout at the top of our voices. It is

immediately replied to by a perfect chorus of voices, each obliterating the other. One forgets that though you ask the question of one man, every person in the village, of whom the greater part are looking up at the balloon, hears one equally well, and all shout back in answer. Well, see! there is the railway, and it is time we were getting down. So we will come down as near to the station as we can. Now, put all your maps and instruments and things away—and look out! Remember to hang on tight in case of a bump. Don't stand stiffly upright, or you may jar your spine; so keep your knees bent, and crouch down so as to avoid branches, &c. And, above all things, *don't* be thrown out. Now open goes the valve and down we go. We are falling a little too fast, so out with some ballast.

Hear it spattering on the trees below! There is a nice open field just beyond those trees. We are nearly in the tree-tops; but out goes the grapnel, and relieved of its weight, we shall just clear them. The grapnel falls into the trees, where it is bound to hold, and we sink gently into the field. How different it all looks! Labourers and others come running up and lay hold of the car. But stay! don't get out just yet. We must let a little gas out, or the balloon would shoot up when relieved of the weight of a person. There, now, she is getting faint from loss of gas (for the valve is being kept wide open), and so now you can step on to *terra firma* once again. How confined it all does seem! No view—nothing visible except trees close around; one cannot see the village, the railway, or anything! One

longs just to rise again, if only to see the way; but already the balloon is being rolled up and packed away into its car, to be borne off like a dead thing to the station and taken home.

IN AN ITALIAN WAR BALLOON

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THE great Gordon-Bennett balloon race (in 1906), which I went to Paris to see, had attracted so much public attention that the aeronautical fêtes held in connection with the International Exhibition at Milan were completely thrown into the shade. This was a pity, since the authorities concerned had for many months past been energetically striving to work up a universal interest in the event.

The Conference of Scientific Aeronautics, which drew together delegates from all parts of the world, met daily

for a week. In the Exhibition were included a great number of interesting aeronautical objects, especially those exhibited by the various military balloon establishments. In large sheds in the grounds were several inflated balloons, including one of the uncanny, caterpillar-like German war balloons with its complete complement of waggons. Then there was the inevitable captive balloon for public ascents. Flying machines of several sorts were there too, models as well as full-sized and elaborate contrivances. Among the latter was the weird machine of M. Bellamy, a huge conglomeration of box-kites, aeroplanes, and other arrangements, to be propelled by four propellers worked by a powerful motor.

The culminating event of the meeting was to be the ascent of eight balloons at once from the Exhibition

grounds. Sunday morning broke calm and misty. Scarce a leaf stirred, and all objects beyond a few hundred yards distant were obscured in fog. Crowds of people flocked from all parts towards the ground—well roped in—from which the ascents were to be made. There stood the eight balloons in various stages of preparation. They were of many sizes and varieties, but it will be sufficient to notice alone one silvery globe, in the car of which I was destined to go. This was the representative of the Italian Military Aerostatic Corps. The others were mostly privately owned.

The usual sizes of the war balloons in Italy are 240 and 450 cubic metres, but this was a comparative giant of 900 cubic metres—that is, nearly 32,000 cubic feet, which, although not very big as balloons go, is three times the

size of our ordinary English war balloons. The shape is spherical, but the lower part has no neck such as we are accustomed to, but is closed by a small automatic valve opening outwards when the pressure of the gas becomes great. To one side of this a pipe of the same material as the balloon, and about a foot in diameter, depends, and hangs to a length of six or eight feet below the car. When the gas in the balloon expands it descends in this pipe, which is usually tied in in the middle. This forms a ready guide to the aeronaut to show when the balloon is fully distended; but it has one drawback in that when the gas does expand and issues from the bottom of the pipe the fact is made very evident to one's olfactory senses. The material is silk, which, after being varnished, is covered over with

powdered aluminium. The result is not only pleasing to the eye, for it gives a beautiful metallic lustre, but renders the material much more gas-tight.

As each balloon ascended it drifted slowly towards the north-east, and soon, with rather amazing suddenness, became lost to view in the low-lying clouds.

At 11.35 our turn came to cast-off, and we rose steadily into the mists. My companions consisted of the Italian officer in charge (fully equipped in uniform, even to his spurs) and an officer of the German balloon corps. The official language of this international coterie was French, interspersed with many a word of Italian, German, or English. The mistiness which surrounded us soon seemed to dissolve away. Above a hot bright sun struck

down upon us, and suddenly we beheld five other balloons moving close by and standing out boldly against a background of white clouds. Later, as we rose higher and higher in the baking sunlight, we discerned the remaining balloons popping up one after another out of the floor of fleecy clouds. Thus we remained for a couple of hours. Rifts in the clouds often disclosed patches of the earth beneath, but these glimpses were sufficient to inform us of an important fact. Not only were the clouds (about 1000 feet below us) now slipping under our feet at a fair rate to the north-eastward, but we even noticed that we were travelling slowly over the earth in an exactly contrary direction.

As this is an occurrence that I have frequently noted, can it be that contrary currents of air form clouds in

the lower strata? That is a point which it is difficult for meteorologists to decide upon, since, as a rule, we have nothing to guide us as to the direction of the wind except the clouds themselves.

And now, while at a height of some 3000 feet, the clouds below were breaking up, and more and more of the country became exposed to our view. The other balloons had gradually drifted away in different directions, and were now dotted about, some high above us, others low down, apparently near the ground. An incident then occurred which might have had rather an alarming effect on the nerves of a novice. The lower valve of the balloon was connected by cords to a rope which was securely fastened to the bottom of the car, I cannot say with what particular object. As we lounged in

peaceful solitude, quietly gazing on the scene below, we were rudely awakened by a report and a jerk to find that this rope, fully as thick as one's little finger, had snapped. It seems that it must have been too tightly fixed, and as the balloon distended, nearly the whole weight of the car was brought to bear on the one rope. Luckily the accident had but little effect, and a fresh bit of rope soon secured the broken ends.

Several of the other balloons had now disappeared, having, presumably, completed their allotted span of life, and soon after we were able to watch, some miles away, the peculiar sight of two balloons making a landing within a few hundred yards of one another, while a third was coming down close by. However, *we* were not for a descent yet. The clouds had cleared

away, and a fine prospect lay beneath us. The whole city of Milan was spread out about five or six miles off. The houses extending along the roads towards the country gave the whole a star-like appearance, and the great cathedral stood out boldly in the centre. Our pace got slower and slower till we hovered over one spot, slowly circling round and round. Then we steadily rose, and finally, at 6700 feet, a grand sight, such as we had long been hoping for, burst on our gaze. It was a view of the Alps. At first hardly recognisable from the far-away masses of white cloud, the mountains soon became more defined, and finally Monte Rosa stood up boldly over the sea of clouds. Then other rugged semi-snowclad ridges appeared until the whole panorama was visible, stretching away to the westward in peak after

peak, till the faint mass of Mont Blanc completed the chain in the far, far distance. Reference to my map shows this summit to be 120 miles away!

We had been up for nearly five hours, when it was decided that we might, at all events, descend to lower altitudes, and it was naturally a matter of interest to watch how the descent was to be conducted. I may here mention that, in Italy, as in many other countries, an anchor is very seldom used, and we had none. On a balloon coming to earth the ripping cord is always pulled, which rips the balloon up and lets out all the gas in a moment. Personally, I am always a little afraid of the ripping cord. It might so easily be accidentally pulled, and should, of course, never be touched till the balloon is actually on the ground. In order to distinguish this from the ordinary valve-

line, we always use a *rea* cord, while the valve has a white one.

Well, it was decided that we should descend. The aeronaut counted his ballast bags—we still had six left. He looked around to see that all was right, and then, without looking up, raised his hand to pull open the valve. My heart gave a bound within me when I saw his hand grasp the *red* rope and then his other hand seize it too, with the intention of giving a long pull and a strong pull! Instinctively I seized his arm, and at the same moment so did our German friend. What is the French for "tear-rope"? We soon made ourselves understood, but to our surprise the Italian took it very calmly, and persevered with his pulling, merely remarking, "In Italy we use red for the valve-line." And so it proved. But this is a most serious matter. Had

I somehow been taken up alone in the balloon, or had anything happened to the aeronaut, I should certainly have pulled on the *white* line to come down, and what would have happened I will not attempt to describe. In France and in Germany I understand red is used for the ripping line. It should, of course, be universally so. Yet if it be now forthwith changed in Italy, there is great fear of awkward mistakes being made by those accustomed to pull the red cord.

Our landing was uneventful, except that we came down perhaps rather more rapidly than was intended, and it so happened that instead of dropping on a flat grass field, we just hit off the side of a ditch which traversed the field, so that the car upset and landed in the mud.

A highly delighted crowd of Italian

peasants, which one could not help associating with organ-grinders, soon surrounded us, and assisted willingly in packing the balloon. We repaired to a quaint old farmhouse near by, where we drank international courtesies in sparkling red wine, and made merry with the people while awaiting the carriage which conveyed us back towards Milan.

THE NAVIGATION OF THE BALLOON

THE NAVIGATION OF THE BALLOON

Theory of Ascent.

An aeronaut should know something of the theory of the ascent of a balloon. As a sheep is clothed with wool, so this earth of ours is surrounded by a layer of what we call the atmosphere. This consists of a mixture of gases, known to us as air. This air is so flimsy and subtile that if we jump into it, it will not support our weight, but will let us drop heavily to the ground in obedience to the attraction of gravity. In other words, the substance of the air is comparatively very light. If we

take a bottle full of air and weigh it, and then extract the air by means of an air-pump, we find that when empty the bottle weighs less—that is to say, air has appreciable weight. If we make careful measurements, we find that one cubic foot of air weighs ·075 lb. Remember this, as on this one fact all the principles of the balloon rest. The first idea of a balloon was to make a large vessel and exhaust it of air. This would, of course, rise through the atmosphere, just as a bubble rises through water. But in practice it would be impossible to exhaust a balloon without making it of sufficient strength to withstand the pressure of the atmosphere, and that would involve materials far too heavy to be lifted. The next question to take into consideration is whether there is any substance which weighs less.

If we weigh bottles full of different gases, we shall find that hydrogen is by far the lightest, weighing but ·005 lb. per cubic foot. Now it is easy to suppose that if a bubble of hydrogen were released it would rise in the air. So far the old philosophers, towards the end of the eighteenth century, had got. Dr Black had said this much, but he could not find any suitable material in which to enclose the hydrogen to keep it separated from the air. Then Cavallo suggested soap bubbles, and filled the same with hydrogen, and they rose in the air. But a little later the Montgolfiers caused a balloon to rise by heating the air within it. Charles, in France, made a big balloon, very similar to that used to this day, and inflated it with hydrogen, when it rose, carrying a man with it.

The theory of the balloon is that it displaces a given bulk of air, and from the weights already given we can easily calculate what weight a given volume of gas will lift. Thus if a cubic foot of air weighs ·075 lb., and a cubic foot of hydrogen weighs ·005, we see that a cubic foot of hydrogen will lift ·07 lb.—so 1000 cubic feet will lift 70 lb.

Military balloons are filled with hydrogen, which, though the lightest gas, is not easily procurable unless specially made. But the ordinary coal-gas, as used for lighting, is mostly composed of hydrogen, and is much lighter than air, and will therefore cause a balloon to rise. It varies a good deal in weight, but may be taken at about half the weight of air, so that its lifting power is somewhere

about 35 lb. per thousand cubic feet. When we come to filling a balloon, it is as well to test the specific gravity of the gas,—the most practical way of doing which is to inflate a small balloon of known capacity and see how much it will lift.

If, then, the "lift" of gas be known, it is easy to find out what size of a balloon is required in order to raise a given weight. Let us suppose that we want a balloon to carry three men to a good height. The balloon, with net and car, as we shall presently see, will weigh about 400 lb. Three men at eleven stone will weigh 462 lb.; the various paraphernalia, say, 38 lb.; and an allowance of ballast of about six or seven bags of 30 lb. (some of which must be discharged to get a good lift) will total up 1100 lb. Now if one

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thousand cubic feet of coal-gas will lift 35 lb., it will take over thirty thousand to lift the desired weight.

But it also has to be remembered that the higher we go from the ground the thinner and lighter the air becomes. Roughly speaking, for every thousand feet of ascent the air weighs less by one-thirtieth. So, if on the ground a thousand cubic feet weigh 75 lb., at one thousand feet up it will only weigh 72½ lb. Thus we can soon calculate to what height the balloon will ascend. If a balloon is required to rise to ten thousand feet, the air displaced will, at that height, only weigh two-thirds what it weighs near the ground, so that the lift required will be one-third more than the actual load.

The Balloon and Fittings.

The material of which the balloon is composed is an important consideration. It has to be gas-tight or nearly so, and yet it must be light. In practice balloons are usually made of cambric. Silk, though expensive, is often used. Our military balloons are constructed of layers of goldbeaters' skin; but this, though very good for the purpose, is still more expensive, and is made by a secret process which cannot be satisfactorily followed by the ordinary maker. The cambric or silk is dressed with a varnish composed of boiled linseed-oil and other ingredients, and, as a rule, weighs from ·03 to ·04 lb. per square foot, or, including seams, it may be taken at about ·05 lb. The following table may be

useful in calculating the weight and capacity of spherical balloons.

DIAMETER.	SURFACE.	CAPACITY.	LIFT, C.-G.
Feet.	Sq. feet.	Cubic feet.	lb.
31	3,000	15,500	540
34	3,600	20,500	720
36	4,100	24,400	854
38	4,500	28,700	1050
40	5,000	33,500	1180
42	5,500	38,800	1440
44	6,000	44,600	1560
45	6,400	48,000	1680
46	6,600	50,900	1780
48	7,200	58,000	2030
50	7,800	65,400	2290
58	10,500	102,000	3570

It will not be necessary here to go into the subject of the practical construction of balloons. All that need be said is, that they are usually composed of a number of gores or panels, sewn together so as to form a spherical or pear-shaped envelope. At the very top is a round hole, in which

is fitted the valve. At the bottom is the neck or tail, which is generally left open so that the gas can escape through it when the pressure becomes excessive. Occasionally this is closed by a valve opening outwards, but normally held shut by springs. The top valve is made in many varieties of pattern, but usually consists of a strong wooden hoop, around which the envelope is securely attached, and this forms a frame for the doors, usually two, of the valve. In what is known as a "butterfly" valve, a bar runs across the hoop, and two semicircular doors or flaps are hinged on to this. These doors open downwards, but are kept shut by means of springs until pulled open by the valve-line. Small cords are fastened to the under side of the doors and connected to the valve-line, which leads down through the balloon and the

neck to the car. It is very necessary for any one wishing to manage a balloon to thoroughly understand the working of the valve. Once the balloon is inflated the valve rises out of sight and cannot be examined, but it is sufficient to know that pulling the valve-line causes the doors of the valve to open downwards, and so let out gas. The valve is generally luted with grease or vaseline, so as to ensure the doors fitting gas-tight.

In addition to the valve (or sometimes instead of it), there is another means of letting out the gas, and that is by means of the "ripping panel." This is like a small gore of the balloon, running from near the top down to the equator or middle of the balloon. A cord is attached to this, which, if pulled, tears the panel right down, causing a large rent which

quickly lets out the gas. This is an old idea, often used on the Continent and in America, but it has only recently come into common use in England. Great care is of course necessary to distinguish the valve-line from the ripping cord, and the latter is therefore coloured red.

In order to distribute the weight of the car and its occupants evenly over the supporting surface of the balloon, a net is spread over the latter. This is made with varying sized meshes, so that they are smaller at the top, where the pressure is greater. At the lower portion of the net the meshes are brought together, and are fixed to the "leading lines," by which it is fixed to the hoop. The hoop is a strong circle of wood, usually strengthened by winding rope, wire, or steel bands around it. The leading lines from the

net are connected to this by a number of toggles, and the car-lines which support the car are similarly attached. The anchor cable and the guide-rope are also securely fastened to the hoop.

Cars vary a good deal in form and size. They are nearly always made of basket-work, which is light, strong, and rigid. The old-fashioned rounded shape, bulging out towards the bottom, has many advantages over the modern French square shape. Cars have sometimes been made with a cork belt or light padding, so as to float should they fall into the sea, and support the occupants. This seems a most wise precaution, but if not adopted, cork seats can easily be put in.

Anchors and grapnels also vary considerably. Aeronauts differ greatly as to the desirability of a heavy and really reliable anchor or a small hook just to

catch hold with. The latter is quite sufficient on a calm day, but may be worse than useless if blowing strongly.

The Inflation.

Having taken the balloon to the ground, it is unrolled, the valve attached and luted, and the valve-cord tied on. The net is then attached to the valve-hoop, and spread out. The gas-hose is connected to the neck by means of a tin cylinder, which is inserted into both neck and hose, and firmly bound on. The other end of the hose is connected to the gas supply.

The balloon is then "crowned"—that is, the valve is brought over the neck and then the envelope evenly spread around, radiating from the centre with the net lying on it. Sand-bags are distributed all round, the hooks of the

bags being hooked to the net, so as to keep the whole down.

The gas may then be turned on, and as the balloon fills up, the sand-bags will have to be continually shifted to lower meshes of the net. It is very desirable to have plenty of sand-bags, since sudden squalls may spring up during the time of inflation, and might whisk away the whole business were it not securely held down. But many bags need many hands to shift them. It is advisable, as a precaution in windy weather, to tie a strong rope to the leading lines of the net and securely fasten it during the inflation.

Meanwhile, while it is filling,—and the process may take from one to three or four hours according to the size of the balloon and the pressure of the gas,—the car may be got ready. This is a matter more difficult than

is often thought. If coats, provisions, cameras, rugs, and instruments are thrown in pell-mell, and a lot of ballast bags, ropes, and the balloon cover piled on top, some little confusion and disappointment may result. It is best to collect any articles that will not be required till after the descent and pack them together in one parcel, and this may be slung on outside the car. Of course, all instruments for observation and use during the voyage are best hung up on the car-lines or hoop, but this will have to be done after the car is attached to the balloon.

Instruments.

Of instruments to take there is first the *Aneroid*, which is to show the height attained. Very good clear in-

struments are now obtainable, specially made for the purpose. The needle shows the air-pressure (*i.e.*, height of the barometer in inches), while outside the dial is a movable circle marked in thousands of feet, which circle must be set — that is, the zero of the scale placed opposite the point of the needle. Then, with sufficient exactitude for practical purposes, the needle will, during the voyage, point to the actual height.

Another instrument now often taken is the *Barograph*, which is nothing more than a self-registering aneroid. The clock-work of this has to be wound, and the needle inked and set to zero. If not required for observation during the trip, as when another aneroid is taken, this instrument may then be stowed away anywhere where it will be safe, and the record of rises

and falls can be referred to after all is over.

A *Thermometer* is seldom of any importance, though it is of interest to see what temperature is found at different heights.

The *Statoscope* is an instrument to show whether one is rising or sinking, acting on the same principle as the aneroid. I have used an anemometer mounted horizontally over the side of the car for the same purpose, and it does very well. A light ribbon flag answers the same purpose; but bits of torn paper when thrown over are a very good indication of the rise or fall, and indeed are sometimes more reliable than the statoscope, since they indicate the motion of the balloon through the air; and if it be, for instance, carried by a downward current of air, the statoscope will register a fall even

though the balloon may be mounting through the air.

A *Compass* is useful in case one gets lost, which often occurs after being above the clouds.

A *Telescope* or field-glass will be of use, though seldom of importance. As for *Cameras*, that, of course, is a subject that I need not here go into, though it may be as well to remind the amateur photographer that the car is an awkward place wherein to manipulate a large and complicated instrument.

Maps may almost be included as instruments, and are most necessary. The aeronaut who loses his way on the ground is liable to get into difficulties. He may suddenly find himself approaching the sea, and, owing to the interposition of clouds, may not notice this till too late; or he may, on seeing a stretch of water ahead, get

alarmed and rapidly descend, whereas a map would have shown him that the water was easily crossable.

Ordnance-maps are the best, as details accurately marked are much easier to follow than if, as in so many maps, the roads and railways are only roughly inscribed. It is always best to mark the course in pencil on the map, else, if the attention is momentarily diverted, one is very apt to lose the way and never find it again. If the course has been marked up to a certain point, the position can soon be picked up again by following in the known general direction as marked.

The chief points to look out for are towns, railways, and water. When a reliable ordnance-map is used, the direction of roads, especially at junctions and cross-roads, is recognisable.

Another most useful and necessary

article to take is a Bradshaw's Guide. One often passes near a station, and it is very convenient to know when there is a train to take one back, or whether to go on to another station on the line of advance.

Ballast.

The *Ballast* to be taken must be kept distinct from the sand-bags, which are merely to keep the balloon down during inflation. The latter may be filled with any coarse stuff, but the former must contain only fine, well-sifted sand, so as not to do any damage if dropped on people or house-tops. This sand should also be quite *dry*, else it is liable to get frozen hard at a great height. Ballast-bags usually weigh about 30 to 40 lb. There is a rough and ready method of weighing

these by lifting them by the cord-loop hooked on to the end joint of the first finger. This, with most men, will not support more than 30 lb. The second joint will support 60 lb.

As to the amount of ballast to be taken, it is, of course, desirable to take as much as possible, but there should be at least as much as will equal half the weight of the guide-rope, and for this reason. In trailing it may be necessary to rise to avoid some house or other obstacle, and then ballast must be thrown out. It is always necessary to have a bag or two for emergencies on landing.

The Ascent.

When the balloon is nearly full the leading lines from the net are fastened to the hoop, and then the car is

brought up, and the car-lines also toggled to the hoop. The anchor-rope and guide-rope are also duly fixed. The latter should be done up in a ball and tied with light twine. Then, when well up, the twine is cut and the ball dropped, when it unrolls and hangs down to its full length. A number of the sand-bags which have been keeping the balloon down are usually piled into the car or hooked on round it; though when facilities exist it is much better to leave all these where they were, and hold the balloon down by means of ropes. A ring, or, better still, two rings, firmly anchored in the ground, enables this to be nicely done. When the balloon is quite full, the gas is turned off and the hose detached. It is now most important to see that the valve-line is all right, and, having seen to this, the

neck is temporarily tied up. This latter operation is not, as a rule, really necessary, unless it be blowing strongly, and often is the cause of trouble. Not much gas need be lost in the few minutes before the start.

Now comes the exciting moment for the voyagers to take their seat. They clamber in, and the heavier sand-bags are taken out. Then the lift has to be determined. One by one the ballast-bags are ejected, till it is seen that the balloon has a decided upward tendency. The amount of lift will depend on circumstances. If it be a calm day, and the space around quite clear, it looks better to make a very gradual ascent; and if the balloon rushes up quickly, it is liable to lose a lot of gas. But care has to be taken that it is not "false lift," caused by an upward puff of wind, or by a push

from the assistants. One has often seen a balloon make a beautiful ascent up to some hundreds of feet, and then steadily sink right down again, notwithstanding the profuse discharge of sand on the heads of the onlookers. In a confined space, or with a strong wind, it becomes necessary to jump up smartly and chance the loss of gas.

So we come to the question of where to start from. It will very often be desirable to tow the balloon away from the spot where it has been filling, in order that it may rise without any risk of colliding with buildings or trees. Some aeronauts make a practice of letting it up on a long rope till it is quite evident that all is clear, and then letting go the rope. Green, and also Coxwell, used a "releasing hook," which firmly held a loop of the rope till the handle was pulled. It is,

however, usually quite sufficient to take a turn of the releasing rope round the hoop, and hold the end in one's hand. If blowing, a strong rope is required. In one of my first ascents I used a smallish rope, and to my surprise this snapped like a bit of cotton, and off we went! But on the usual calm day the car can quite easily be held down by the assistants without any rope, who merely let go on the word being given.

Before cutting all ties with mother-earth, one should take a last look round the car. See that the valve-line is all right; and it may even be advisable to test the valve by a pull on the line, although this test not only wastes gas but may disturb the luting and cause a small leak. Count the number of ballast-bags, and get one or two ready for instant discharge

in case of necessity. Give directions to your fellow-passengers as to what they are to do, and let one of them hold a ballast-bag on the edge of the car, ready to empty it on your word.

Remember that, on ascending from a sheltered spot, when clear of the shelter the balloon may take a sudden turn, and dash you into a tree or building.

The great art in making a good ascent is to be sure that the balloon is quite steady and upright. If started on the slant, the car will swing under it as it rises, and this swinging will continue for a long time after.

In Mid-air.

We are now clearly started on our voyage, but several matters have to be attended to. The guide-rope has

to be let down, as already explained. The cable, too, has to be undone from its coil and allowed to hang in a bight, the one end securely fastened to the hoop, the other to the grapnel, which is merely hooked over the edge of the car.

The map should now be got out and the direction of the start marked. The passing over well-known places enables one to get a good idea of the direction of the journey.

The most usual object to attain is to keep the balloon as long as possible in the air. To effect this, it is necessary to economise gas and ballast, and the way to do so is to maintain an even altitude. The rise and fall must be perpetually watched. If the balloon starts to descend or ascend, it is likely to continue at an accelerated rate. Any tendency to move vertically must

be at once checked. Sometimes one can go for hours almost without discharging a grain of ballast. At other times the balloon will keep rising or falling. Much depends on the weather. If the clouds are moving quickly across the sun the temperature will continually vary, and in thundery weather one experiences all sorts of odd effects. There is a great art in discharging ballast. Experience alone guides one how much to discharge at a time. Sometimes a small handful will "do the trick." A balloon is often a bit casual and slow in complying with one's desires. Don't hurry it. If it doesn't at once respond to a discharge of ballast it may do so presently.

There is a very pretty little experiment that may be made when it is desirable to throw out some ballast. Take a piece of newspaper about a

foot square and lay it on something flat while you pile a couple of handfuls of sand on the middle of it. Now take it up by the four corners and drop it over. As it falls the corners of the paper begin to flap, and as the speed augments the flapping becomes more rapid and noisy, till it makes a shrill rattle. Then, as the pace becomes very great, the pressure below on the paper becomes excessive, and suddenly the paper bursts, and the sand, dispersing in a cloud, gives just the appearance of a bursting shell. This system of discharging ballast has its uses too, for when one is descending rapidly the sand thrown out loosely falls slower than the balloon, and smothers one with dust. When thrown out on the paper it falls quicker than the balloon, and gets dispersed in time.

After a considerable height has been attained, a careful descent is necessary. It has already been said that a balloon once started is likely to increase its rate, and if the valve be opened till the vessel takes a downward turn, it will be apt, if not carefully watched, to acquire a great speed, and practically fall to earth with a bump. The drop should, therefore, be constantly checked if ballast is plentiful, but the best way is to let the balloon gradually fall, only occasionally giving a touch to the valve.

Sometimes a balloon doesn't seem inclined to come down, and the valve will have to be opened again and again before any effect is produced.

If the descent becomes very rapid and seems dangerously so, the neck-line, which is normally fastened to the hoop, should be detached, so that

the balloon may parachute,—that is to say, the lower part may collapse into the upper and form a concavity. When actually landing in a wind, however, the neck-line should be made fast, else the wind will get into the concavity and act with great force, even after all the gas is let out.

A balloon is often affected by some temporary circumstance, such as an obscuration of the sun behind a cloud, or a slight shower of rain. I have known one come right down and settle on the ground for some minutes, and yet rise again and continue its journey.

Trailing.

One of the pleasantest variations in ballooning is to let the guide-rope trail along the ground. One may go thus for miles, the rope acting as a

regulator, so that one neither sinks nor rises. It is always best to trail a bit before landing, as one is then much better able to choose a good spot; and if not travelling at a great rate, the rope can be caught by men below and the balloon brought down without using the anchor at all. But for this trailing it is necessary that the country should be open—that is, free of houses: trees don't matter. Though damage is not necessarily done to a house by trailing over it, there is always a risk. I have known chimneys to be carried away.

On one occasion we had trailed for some way on a very quiet evening, losing but little gas, and seeing a favourable opportunity were hauled to the ground, where we made the balloon fast for the night and reascended next morning.

Landing.

When, from the ballast getting short or darkness coming on or other cause, it is deemed desirable to make a landing, there are two or three matters to be considered. It is generally convenient to come down not too far from a railway station, so that the map and the railway guide must be brought into requisition. Then it is most necessary to have some assistance, so wait till you see people about before descending. But it more often occurs that the circumstances are all the other way, and that there are too many people. You don't want a crowd, therefore avoid the proximity of a large town.

Having decided to come down, get things arranged. Maps and instruments must be packed away; the bight

of the cable may have to be hauled in if trees are about. Ballast-bags must be looked to, so that if the car falls over on descent they will not fall out.

In selecting a suitable spot for landing, shelter from the wind is perhaps the first desideratum; but it is always well to bear in mind that one often misses the particular spot selected, either because of miscalculating the speed at which one is travelling or the height above the ground. Therefore look ahead and see if the country to leeward is suitable for landing, or whether, if the first point is missed, it will be necessary to go right up again. Houses and telegraph-wires are the chief obstacles to avoid.

It is always pleasantest to come down by the method just described—that is, getting some one to hang on

to the trail-rope. But this is not always possible. If going very fast, not only will it be difficult for the men to hold on, but one must shout to them in time before the trail-rope gets near them; and if going twenty or thirty miles an hour, it is not much good requesting people to run after the rope!

The best spot for landing is usually to be found under the lee of a wood or clump of big trees. Come close down to the trees, and don't mind even touching their top branches, and as you get to the edge of them throw out the anchor. It is sure to catch in the branches, and will land you nicely under the lee of the trees. If no trees are to be seen near where you want to come down, a good hedge is the best thing to look out for. Then come down on the windward side of

the hedge, even bumping on the ground, throw out the anchor, and it will catch for certain in the hedge or bank, while the rebound will deposit the balloon on the far side. I have on several occasions, as detailed in this book, come down right in among trees without doing very much harm to the balloon, and it is perhaps the safest way from the passengers' point of view.

Directly the anchor is thrown—and it is best to get a passenger to do it—the aeronaut must hang on all he knows to the valve-line, and keep it wide open until the balloon is "crippled." The balloon, relieved of the weight of the anchor, wants to go right up again. If this weight be 35 lb., it means that about 1000 cubic feet of gas must be let out to prevent a rise. No one should,

of course, leave the car until most of the gas is out of the balloon. But after one has got out, it may then be desirable to let the balloon up on a rope and tow it to some more desirable spot for packing. Now note the time of descent, also the height of the barometer.

Reference has already been made to the ripping cord. Though I cannot claim to have had much experience with it, it seems to me that its use is only justifiable when descending in a hurry,—for instance, to avoid being carried out to sea, or if approaching a large town. In descending in a stormy wind in open country, it may not be exactly comfortable to be dragged along bumping on the ground for a mile or two, but, so far as I know, no serious accident has ever resulted (with the exception of

the "Géant" disaster). On the other hand, the tear-rope is a most dangerous tool in the hands of the inexperienced, and might easily lead to an awkward calamity.

The first thing to do on getting to ground—if, as is generally the case, a crowd collects—is to get hold of some responsible man as foreman, and ask him to choose, say, six men to help him, and then tell the other people to keep clear. (They won't do so, but you are then free of responsibility and need not pay them.) Give all your directions to this foreman, and afterwards arrange with him for the payment. To save time, at once order a cart to be got ready to take the balloon to the station. See that no one is smoking. Several instances have occurred of the gas becoming ignited, with disastrous consequences.

The packing up of the balloon, though not as important as the other operations, is one which will usually have to be performed under the sole guidance of the aeronaut in charge, without the help of any professional, as is the case with the inflation and start.

When the balloon is sufficiently exhausted of gas it should be pulled down by the net till the valve can be reached. This should then be either taken out altogether or fixed wide open. It is then let up again, and the assistants should get hold of the net and gradually pull the balloon down. Meanwhile one or two men should be employed getting the anchor up and coiling up the cable and the guide-rope. If time and opportunity allow, it is best to take the netting off the balloon and roll it

up separately. The balloon must then be rolled up and wrapped in its cover.

Cost.

A word must be added as to the expense of ballooning. A good balloon may be bought for about £100 to £200, according to the size and material. Gas can be obtained in London for two shillings per 1000 cubic feet, though it may cost a good deal more in other places. A couple of pounds must be spent on assistance in the ascent; and five to ten shillings is sufficient for the descent. So that, with cartage and railway fares, the total cost of an average trip may amount to £6 or £7.

"THE ECLIPSE."

(28,000 cubic feet.)

The following list of weights of my old balloon may prove of use for comparison:—

	lb.
Envelope	264
Car	53
Car seats (two), solid cork . .	5
Net, 20 yds. long . . .	70
Valve, 27 in. diam. . . .	12
Grapnel	35
Cable, 105 ft. long, 2¾ in. circ. .	21
Valve-line, 60 ft.	1
Hoop, 31-27 in. diam. . . .	10
Toggles, 8	2
Car-lines, 8—2 and 1½ in. circ. .	8
Rope for car, 28 ft., 1¾ in. circ. .	3
Balloon cover	8
Car cover, waterproof . . .	5
Guide-line, 1000 ft.[1] . . .	16
Total weight carried .	513

[1] This was unusually light and long.

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